What is claimed is:

1. A method for adaptively allocating resource in a communication system by subsequently processing sub-carrier/time slot allocation and modulation method selection, the method comprising the steps of:

a) computing average channel gains of sub-carriers/time slots for each user by using channel gains of sub-carriers/time slots for each user;

b) computing average numbers of bits for each user by using required data rates and average channel gains of sub-carriers/time slots for each user;

c) computing the number of sub-carriers/time slots allocated to each user and allocating the sub-carriers/time slots to each user; and

d) selecting a modulation method with respect to each sub-carrier/time slot.

2. The method as recited in claim 1, wherein the average channel gain of each user in the step a) is computed by using an equation as:

$$\overline{\alpha_k}^2 = \frac{1}{N}\sum_{n=1}^{N}\alpha^2{}_{k,n}, \text{ for } k=1.....K$$

wherein $\overline{\alpha_k}^2$ is the average channel gain of sub-carrier for each user and $\alpha^2{}_{k,n}$ is the channel gain of sub-

carrier/time slot for each user.

3. The method as recited in claim 1, wherein the average number of bits for each user in the step b) is a solution of K+1 non-linear equations formulated by an equation as:

$$\frac{\overline{c_k} f'(\overline{c_k}) - f(\overline{c_k})}{\overline{\alpha_k}^2} = \varepsilon, \quad \text{for } k=1,\dots,K$$

$$\sum_{k=1}^{K} R_k / \overline{c_k} = N$$

wherein $\overline{c_k}$ is an average number of bits for each user, $f(c)$ is a power to receive c bits data within a range of bit error rate, and R_k is the total number of bits for each user.

4. The method as recited in claim 1, wherein the number of sub-carriers/time slots in the step c) is computed by using an equation as:

$$n_k = R_k / \overline{c_k}, \quad \text{for } k=1,\dots,K$$

wherein, n_k is the number of allocated sub-carriers/time slots for each user.

5. The method as recited in claim 1, wherein the allocation of sub-carrier/time slot in the step c) is an optimal solution of an equation as:

$$\text{Minimize } P_i - \sum_{k=1}^{K} \sum_{n=1}^{N} r_{k,n} \rho_{k,n}$$

$$\text{Subject to } \sum_{n=1}^{N} \rho_{k,n} = n_k, \text{ for all } k$$

$$\sum_{k=1}^{K} \rho_{k,n} = 1, \text{ for all } n$$

wherein $\rho_{k,n}$ is a variable number which determines whether a K-th user uses an n-th sub-carrier and $r_{k,n}$ is a cost for the K-th user to use the n-th sub-carrier.

6. The method as recited in claim 5, wherein the cost for the K-th user to use the n-th sub-carrier is determined by an equation as:

$$r_{k,n} = f(\overline{c_k}) / \alpha^2_{k,n}, \text{ for } k = 1,...,K \text{ and } n = 1,...,N .$$

7. The method as recited in claim 5, wherein a linear optimal solution is solved by applying a Vogel's method.

8. A computer readable recording medium for storing instructions for executing a method for adaptively allocating resource in a communication system including a microprocessor by subsequently processing sub-carrier/time

slot   allocation   and   modulation   method   selection, comprising the methods of:

a)   computing   average   channel   gains   of   sub-carriers/time slots for each user by using channel gains of sub-carriers/time slots for each user;

b) computing average numbers of bits for each user by using required data rates and average channel gains of sub-carriers/time slots for each user;

c) computing the number of sub-carriers/time slots allocated   to   each   user   and   allocating   the   sub-carriers/time slots to each user; and

d) selecting a modulation method with respect to each sub-carrier/time slot.